Knowledge Gaps and Weight Stigma Shape Attitudes Toward Obesity: Insights from the ASK Study

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Substantial evidence shows that weight-related stigma is extremely pervasive, causes physical and psychological harm, misleads public health messages and media portrayal of obesity and leads to discrimination in education, employment, and even in healthcare setting.[1-4]

To measure public knowledge of the causes and remedies of obesity and to investigate the association between certain beliefs about obesity, weight stigma and attitudes towards treatment and research, we conducted a multi-national research survey among the general public and healthcare professionals (*Attitudes, Stigma and Knowledge –"ASK"- Study)*. Here we report analysis of the primary outcome measures of the study.

Between 14th January and 1st November 2019, nationally representative samples of the general population (GP) from the USA (n = 1012), UK (n = 1025), Australia (n = 1021) and New Zealand (n = 998) completed an online, cross-sectional survey. In addition, healthcare professionals (HCPs) were recruited from diverse geographical locations (77 countries) using email invitations sent through professional societies, and medical and academic institutions.

In total, 5623 respondents completed the survey (4056 GP with female/male ratio = 1.03; plus 1567 HCPs with a female/male ratio = 2.07). All participants were aged 18 years and above, with an average BMI of $28.50 \pm 8.81 kg.m^2$ and $24.71 \pm 4.39 kg.m^2$ for the GP and HCP respectively. The survey used a validated metric of weight stigma (F-Scale)[5] and a set of questions specifically designed to investigate beliefs about causes and remedies of obesity, and attitudes toward available treatment options and research priorities. For further details about participant characteristics, methods and data analysis see supplementary material.

Overall, HCPs had slightly lower stigma scores compared to GP (3.40 vs 3.63, p-value < 0.001). Among the GP, younger age and higher BMI were associated with lower weight stigma (p-value < 0.001 - see Appendix for all effect sizes for age; $\eta 2 = -0.00298$, p-value < 0.05 for BMI). Male HCPs exhibited higher weight stigma compared to female HCPs ($\eta 2 = 0.110$, p-value < 0.001).

When asked what are the most likely "causes of a person's overeating", 54% of the GP indicated factors that are implied to be under volitional control and/or personal responsibility (i.e. emotional/comfort eating 42% and gluttony 12%). Food addiction was indicated as the most likely cause by 21% of participants, while 18% indicated a malfunctioning of physiological regulatory mechanisms of appetite/satiety and 4% blamed the food environment. In comparison, 30% of HCPs indicated factors that are implied to be under volitional control and/or personal responsibility (i.e. emotional/comfort eating 28% and gluttony 2%). Food addiction was indicated as a cause by 6% of participants, while 35% indicated a malfunctioning of physiologic regulatory mechanisms of appetite/satiety and 29% blamed the food environment (see Figure 1, Panel A).

Across GP and HCPs, participants identifying gluttony, emotional/comfort eating or food addiction as the cause of overeating exhibited similar stigma scores (range 3.65-3.69, p-value > 0.05 - i.e. equally stigmatising) but their stigma scores were significantly higher than those of participants who listed food environment as the cause or overeating (3.37, p-value <0.01; see Figure 1, Panel B).

We asked whether participants believe obesity and other health conditions can be entirely prevented or cured by a "commitment to following a healthy lifestyle". The vast majority of the GP believed obesity can be entirely prevented (79%) and cured (80%) by merely adhering to a healthy lifestyle. Even among HCPs, a large majority believe that obesity can be entirely prevented (57%) and cured (62%) by a commitment to following a healthy lifestyle. By contrast, far less participants among both the GP and

HCPs believed that a commitment to following a healthy lifestyle could cure cancer, osteoarthritis and HIV infection (see Figure 1, Panel C).

Among both GP and HCPs, those who believed that obesity can be entirely prevented by a commitment to a healthy lifestyle exhibited higher weight stigma compared to those who believed obesity cannot be entirely prevented by mere lifestyle choices ($\eta 2 = .442$, $p < .001$ & $\eta 2 = .304$, $p < .001$ respectively). Likewise, among both the GP and HCPs, the belief that obesity can be entirely cured by a commitment to following a healthy lifestyle was associated with higher weight stigma ($\eta 2 = .473$, $p < .001$ & $\eta 2 = .283$, $p < .001$ respectively) (see Figure 1, Panel D).

We also asked what is the most effective treatment for severe obesity (BMI >35kg/m^2). Contrary to available evidence, the vast majority of the GP (80%) indicated lifestyle interventions as the most effective therapies (diet and exercise = 57%, psychological support and behaviour modification = 23%), whereas only 14% indicated medications and a mere 6% appropriately recognized bariatric surgery as the most effective treatment. Among HCPs, 61% of participants indicated surgery as the most effective treatment for severe obesity, however, a significant number (37%) still believed that lifestyle interventions are the most effective therapy (diet and exercise = 16%, psychological support and behaviour modification = 21%) (See Figure 1, Panel E).

We then asked participants to assess the level of priority for government funding of obesity research on a scale of one-to-five and analysed whether this was influenced by weight stigma. Among the GP, lower weight stigma was associated with higher prioritisation of spending on obesity research (low vs high OR 1.22, p-value < 0.001, medium vs high OR 1.07, p-value < 0.05). No association between weight stigma and the prioritisation of government spending on obesity research was found among HCPs ($p > .05$).

Overall, the results of this multi-country study corroborate previous research demonstrating associations between weight stigma and assumptions that obesity and overeating are caused by factors perceived to be within an individual's control.[1]

In fact, less than 20% of participants among the GP indicated a malfunction of physiological mechanisms as a most common cause of overeating whereas the majority point to factors that are implied to be under volitional control and personal responsibility. Such belief, which appears to contribute to the expression of weight stigma in our study, is in stark contrast with available evidence of the complex biological mechanisms regulating appetite, satiety and body weight,[6] and also with evidence of the genetic and environmental contributors of obesity.[7]

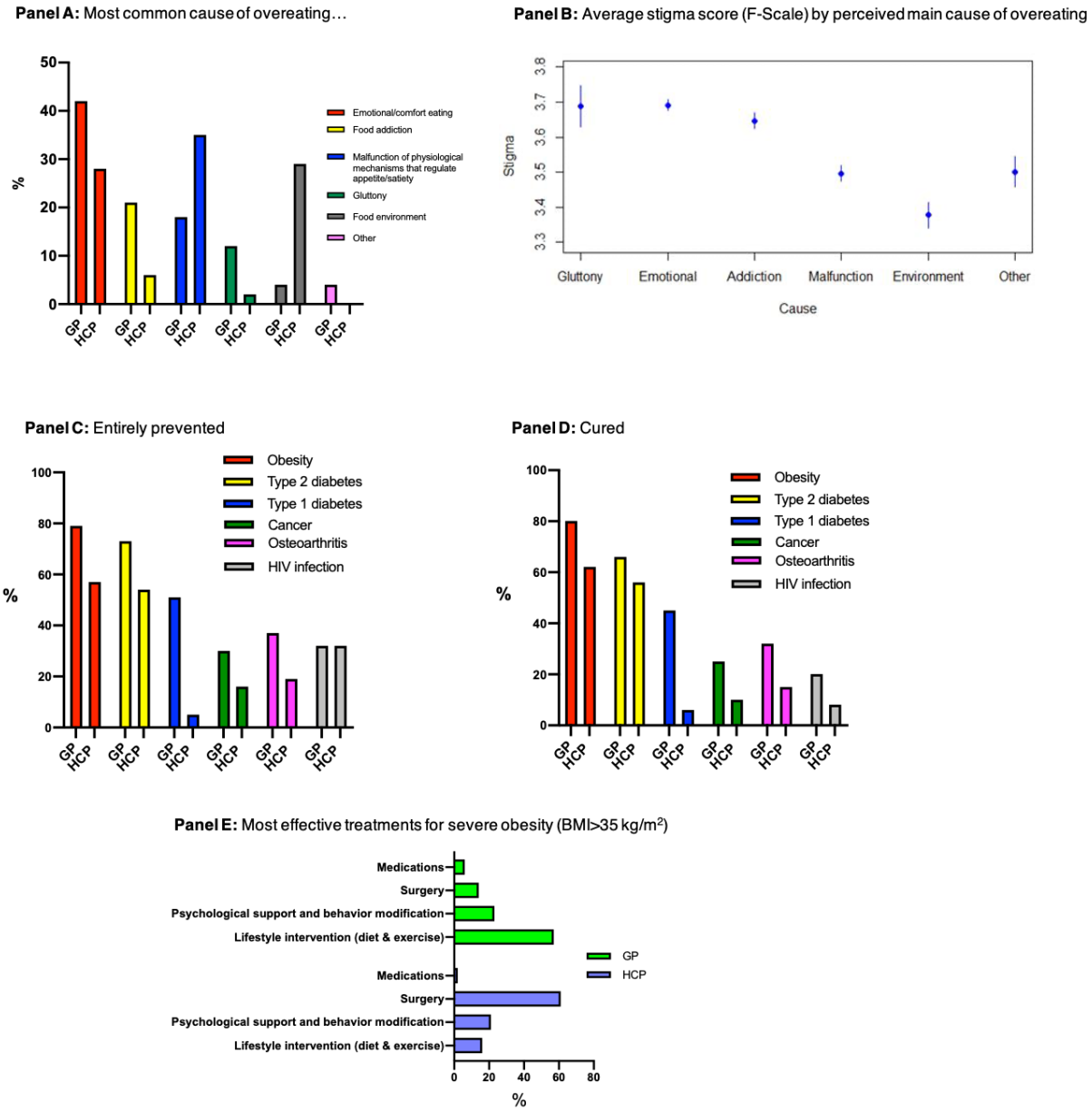
This study also demonstrates a significant gap between current scientific evidence and the beliefs about obesity and its treatments among both the GP and HCPs. In fact, the majority of participants appeared to believe that obesity is entirely curable by merely adhering to healthy lifestyle choices and such belief was a strong contributor to weight stigma. Furthermore, despite compelling evidence accumulated over the last several decades showing that bariatric surgery is more effective than lifestyle interventions and medications in treating severe obesity,[8] only 6% of the GP indicated surgery as the most effective therapy for severe obesity (BMI >35Kg/m^2), an opinion shared by a significant number (37%) of HCPs.

The association between higher weight stigma and lower prioritisation of government funding of obesity research in this study provides further evidence that weight stigma can influence decision-making and may explain why research in obesity is underfunded, proportionally to its prevalence and associated impact.[9]

The results of the ASK study suggest that the gap between popular beliefs and current scientific knowledge may contribute to the resilience and prevalence of weight stigma in society. Educational strategies that improve public understanding of the modern science of obesity may be an effective way to reduce weight stigma.

The conclusions of this study are in alignment with a joint consensus statement and call to action to end weight stigma and discrimination[10] published on World Obesity Day 2020.

Figure 1: Panel A: Beliefs about most common causes of overeating in GP and HCPs. Panel B: Correlation between beliefs on causes of overeating and weight stigma **(**because there was the same relationship between causes of overeating and weight stigma in both GP and HCPs groups, the figure illustrates the effects across both groups). Panel C: Participants believing that conditions can be entirely prevented by commitment to healthy lifestyle. Panel D: Participants believing that conditions can be entirely cured by commitment to healthy lifestyle. Panel E: Beliefs about most effective treatments for severe obesity in both GP and HCPs



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